



NASA Goddard Institute for Space Studies

NASA Goddard Space Flight Center, Office of Education

NASA Education Programs

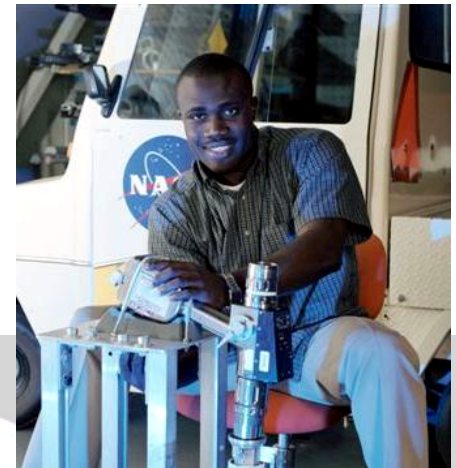
Matthew Pearce,
January 20th, 2016



NASA's Education Mission

Our mission is ...

To advance high quality Science, Technology, Engineering, and Mathematics (STEM) education using NASA's unique capabilities

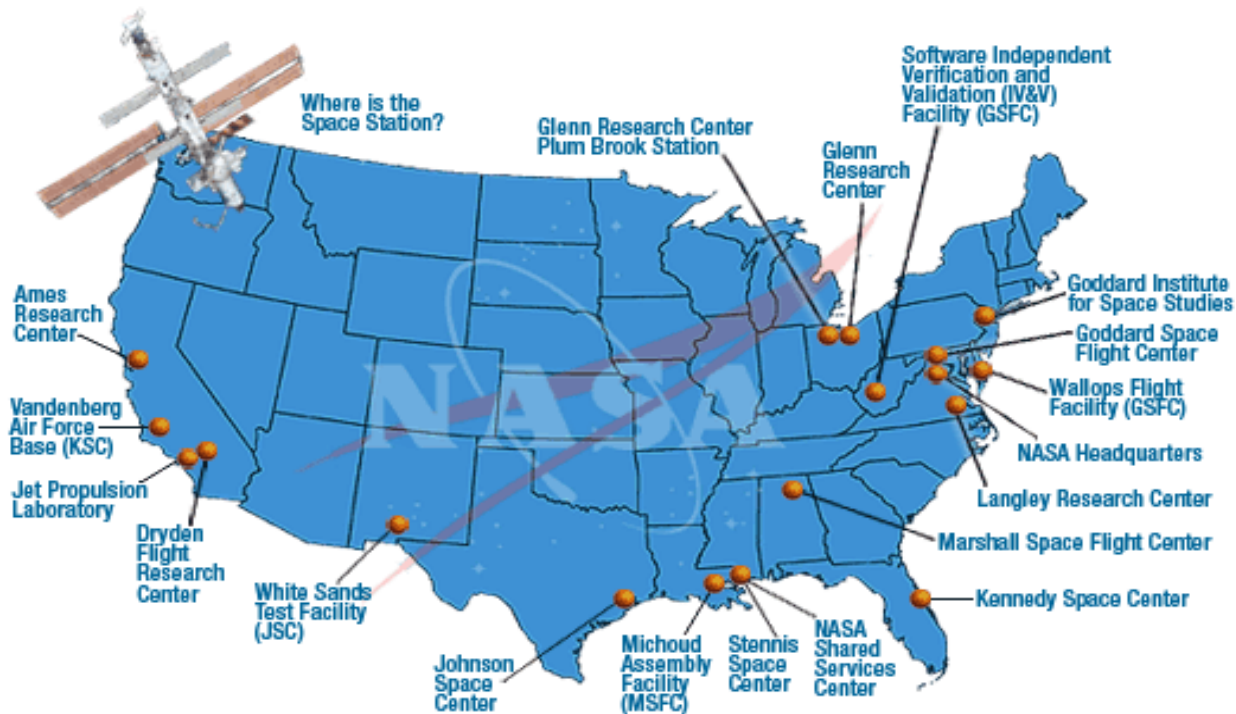


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NASA Centers

GISS supports the New York tri-state area, but around the country, we're located...



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Goddard Campuses

Four campuses with one located on Columbia University's campus here in New York City



Independent
Verification &
Validation
West Virginia



Goddard
Institute for
Space Studies
New York



Wallops
Virginia



Goddard Space
Flight Center
Maryland

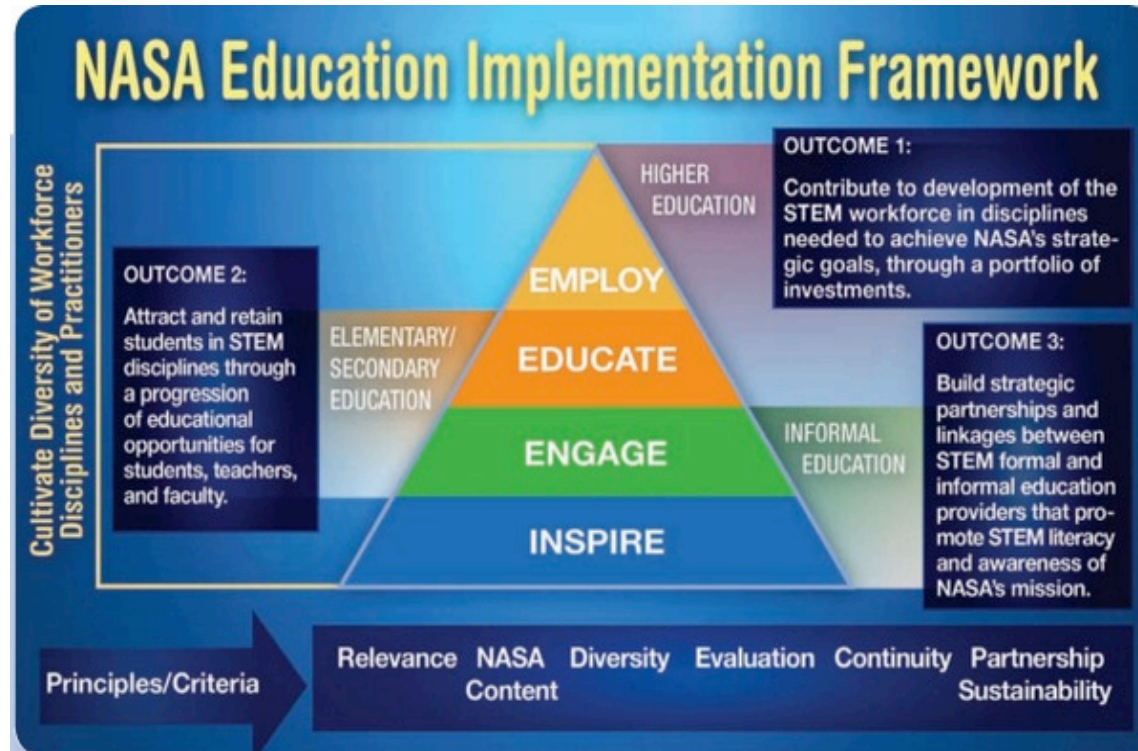


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NASA Education Implementation Framework

Framework embraces four key stages: inspire, engage, educate & employ

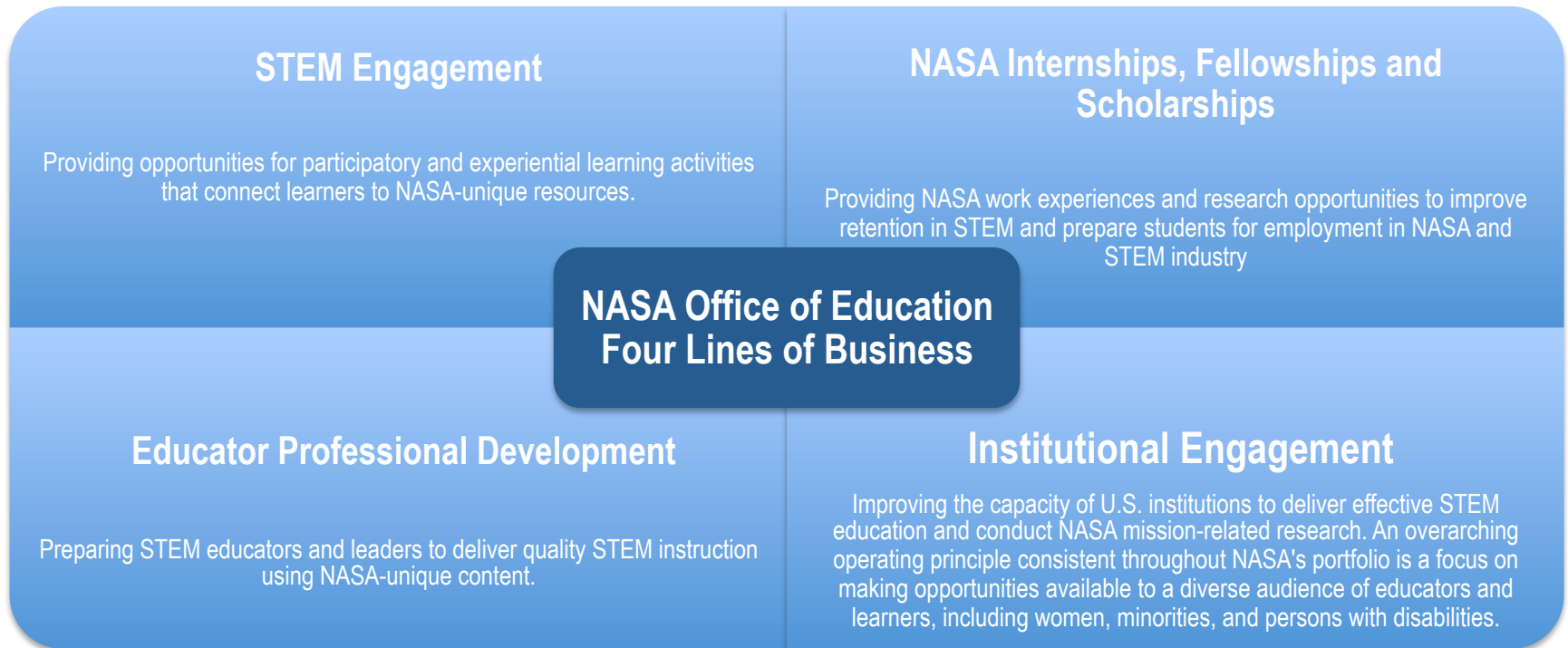


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NASA Education Office's Four Lines of Business

To advance **high quality** Science, Technology, Engineering, and Mathematics (**STEM**) education using **NASA's unique** capabilities

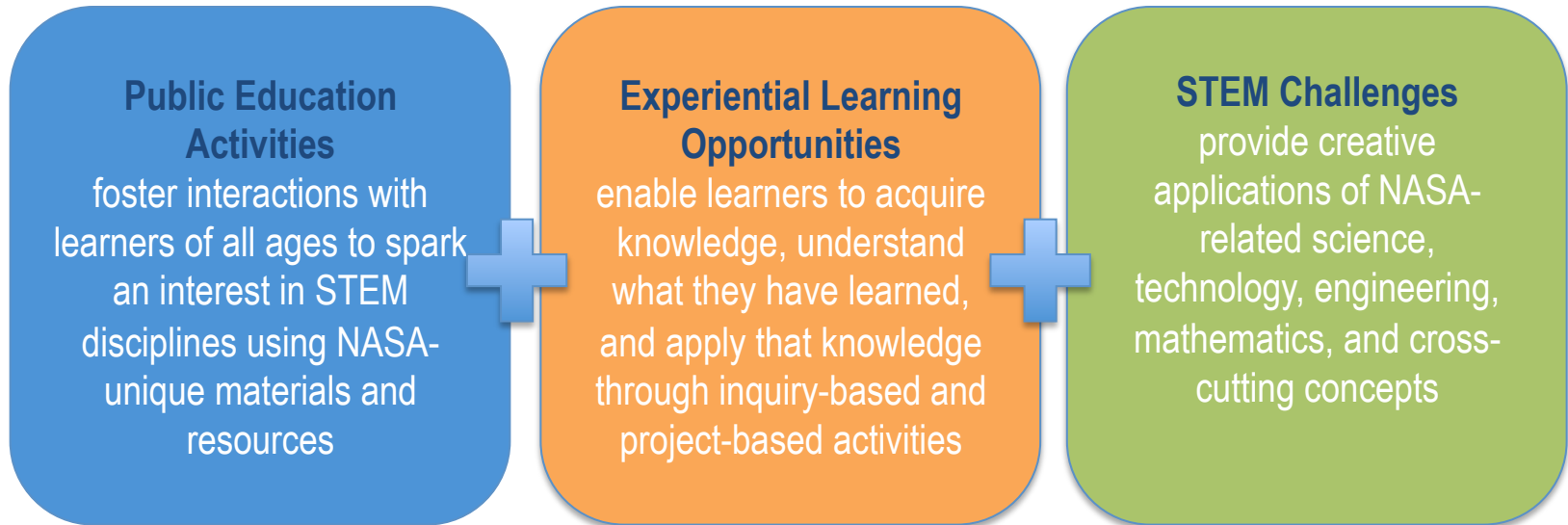


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STEM Engagement

STEM Engagement (SE) activities are designed to provide opportunities for participatory and experiential learning activities that **connect learners** to NASA-unique resources.



STEM Engagement activities are based on best practices in **motivation, engagement, and learning** in formal and informal settings.



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Educator Professional Development

EPD uses NASA's missions, education resources, and unique facilities to provide high-quality STEM content and hands-on learning experiences to in-service, pre-service and informal educators.

- **In-service Educators:** Include those currently practicing in a formal school system.
- **Pre-service Educators:** Have declared an education major or are graduates who have not yet completed training and certification to teach in a formal setting.
- **Informal Educators:** Provide organized educational activities outside of established formal school system.

Face to Face Institute:

F2F interaction at a NASA facility conducted through a single delivery model implemented uniformly across all NASA Centers/Facilities while leveraging content specific to each Center/facility, at grade-appropriate levels based on specific audiences, for a minimum of 40 contact hours.



Partner-Delivered EPD:

Partner-Delivered EPD provides a uniform set of standards for partners to adhere to when developing or offering EPD in concert with NASA.



Online EPD:

Online EPD provides a uniform set of standards for designing, planning and implementing online learning opportunities for educators that encompass a wide range of technologies and approaches that allow participants to go beyond limitations imposed by real-time, in-person EPD.



Community-Requested EPD:

Community-Requested EPD provides NASA Centers/JPL appropriate levels of flexibility to meet and respond to the educator professional development needs of their surrounding communities on a case-by-case basis.

Our efforts help establish linkages between formal and informal education, and encourage informal educators who teach STEM subjects through exposure to and knowledge of NASA-related content.



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Institutional Engagement

NASA Institutional Engagement builds the capacity of formal and informal education institutions to participate in NASA's mission. IE:

- **Improves their capabilities** to gain support from external sources; fosters interactions between NASA Centers, academic institutions, and industry.
- **Supports colleges and universities** by helping them gain access to cutting-edge engineering and science facilities and personnel.
- **Enables informal institutions**, to engage their visitors through exhibits and displays that showcase NASA's dynamic content.
- **Supports the advancement and development of STEM personnel**, programs, and infrastructure to enable formal and informal institutions to conduct NASA-related research and/or deliver NASA-related STEM content.

Institutional Engagement Seeks To:

Build Capacity

Encourage Networks & Communities

Ensure Institutional Diversity

Sustain Capacity

Deliver Content



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NASA Internships, Fellowships and Scholarships

NASA Internships, Fellowships, and Scholarships (NIFS) leverage NASA's unique missions and programs to enhance and increase the capability, diversity, and size of the Nation's future STEM workforce.

- **NASA Internships** are competitive awards to support educational work opportunities that provide unique NASA-related experiences for **educators and high school, undergraduate, and graduate students**.
- **NASA Fellowships** are designed to support research, or senior design projects by highly qualified faculty, undergraduate, and graduate students, in disciplines needed to help advance NASA's missions.
- **NASA Scholarships** provide financial support to undergraduate and graduate students for studies in STEM disciplines to inspire and support the next generation of STEM professionals.



Internships

Fellowships

Scholarships

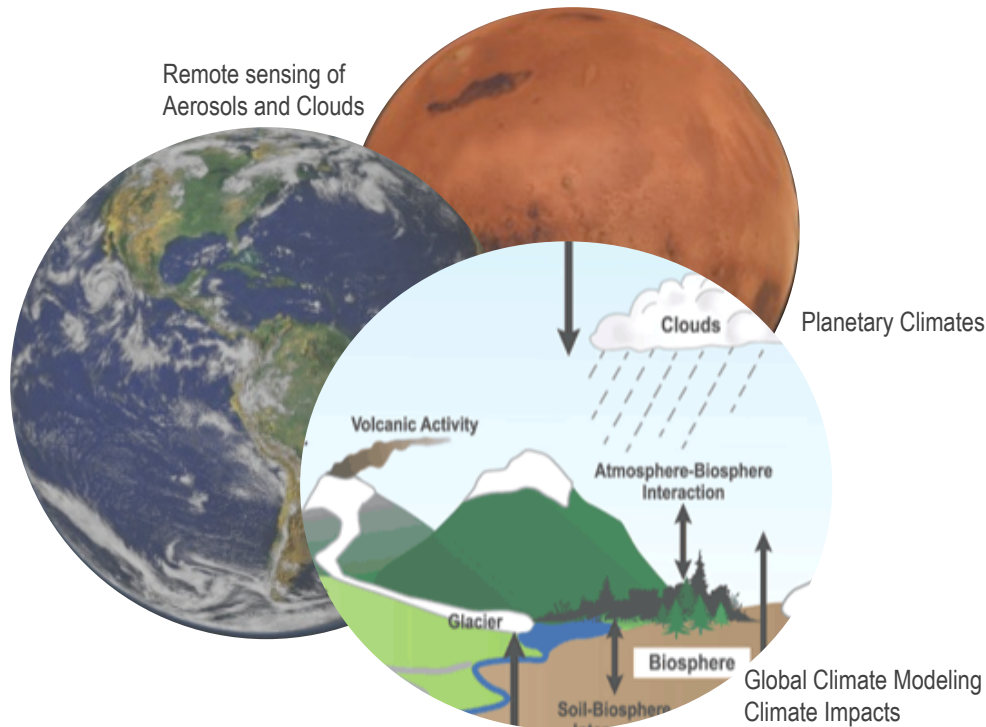


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NASA GISS conducts theoretical and experimental research on the causes and consequences of long-term global change, with an emphasis on education and outreach



The program includes climate modeling, climate impacts, remote sensing of climate system features such as aerosols and clouds, and comparative planetary climates

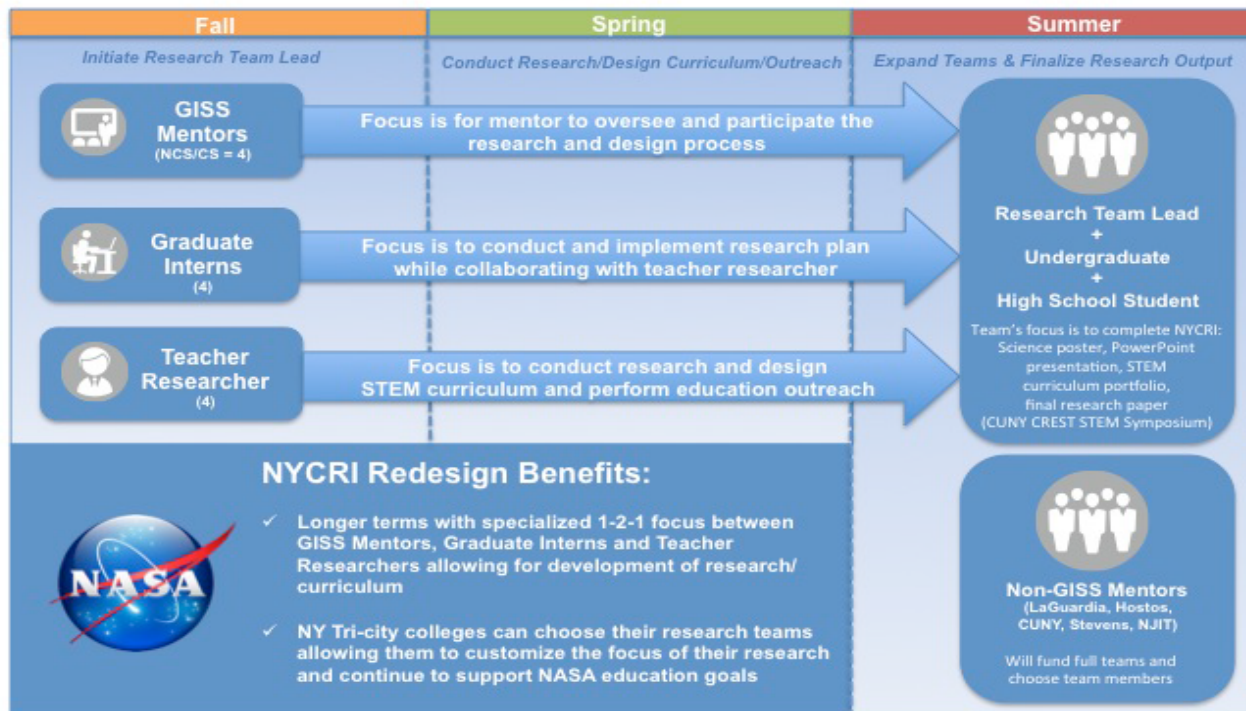


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NASA GISS Climate Change Research Initiative (CCRI)

The **NASA GISS Climate Change Research Initiative** is a STEM education program that strategically integrates the strategies and resources of the NASA Office of Education's four lines of business inclusive of NIF's, STEM Engagement, Educator Professional Development and Institutional Engagement to provide significant impact and discovery to the research associated with the science and topics related climate change.



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NASA GISS Climate Change Research Initiative: High School & Undergraduate Interns

CCRI high school, graduate and undergraduate interns will conduct research, gain knowledge in assigned research discipline, and develop and present scientific presentations summarizing their research experience

Specifically, interns will be expected to;

- Write a scientific research report explaining basic ideas and experimental set-up of the project as well as their contribution to the work
- Prepare and present a PowerPoint summary of their research project to a panel of subject matter experts
- Prepare and present a scientific poster of their research project at the CUNY Summer STEM Research Symposium



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NASA GISS Climate Change Research Initiative Educators

CCRI STEM Educators will conduct research, develop research based learning units and assist NASA scientists with the mentoring of high school, graduate and undergraduate students

Specifically, Educators will be expected to;

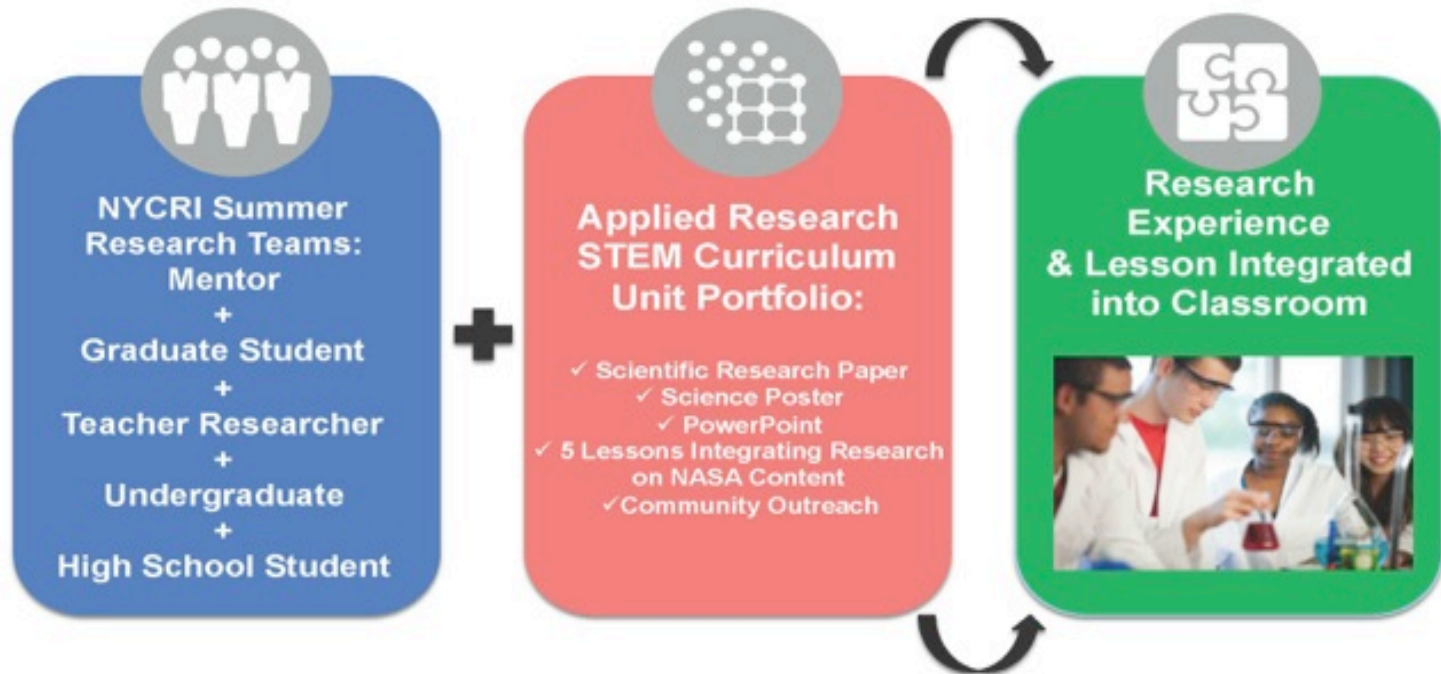
- Create and Applied Research STEM Curriculum Unit Portfolio based on their year long research experience integrating NASA unique education resources, tools and content
- Integrate and implement unique NASA units into their existing STEM courses during the following academic year.
- Mentor and coach high school students in the components of writing a scientific research paper for publishing, team oral research reporting, power point design for scientific presentations and scientific poster design and presentation for local and national research audiences.



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CCRI Program Deliverables



Poster/PPT Symposium @ GISS | CUNY Crest Poster Symposium | Enrichment Activities

*Inspiring the next generation of explorers as
only NASA can!*



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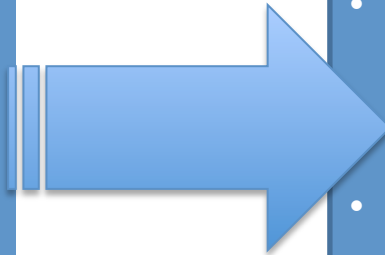


NASA GISS Internship Education Summer Program: High School, Undergraduate, Graduate Interns

High school, graduate and undergraduate interns will conduct research, gain knowledge in assigned research discipline, and develop and present scientific presentations summarizing their research experience

Specifically, interns will be expected to:

- Write a scientific research report explaining basic ideas and experimental set-up of the project as well as their contribution to the work
- Prepare and present a PowerPoint summary of their research project to a panel of subject matter experts
- Prepare and present a scientific poster of their research project at the CUNY Summer STEM Research Symposium



• **Contact: Matthew Pearce**

- Submit a research abstract
- Indicate types of interns desired
- Indicate desired background and skill set required.
- Register in OSSl



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NASA GISS Climate Change Research Initiative Poster



A Study of Blue Carbon in Jamaica Bay 2015

Dr. Dorothy Peteet, Stephen Kovari, Mohammad Reza, Stephanie Stern
NASA/Goddard Institute of Space Studies, Lamont Doherty Earth Observatory, New York City Research Initiative

Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE



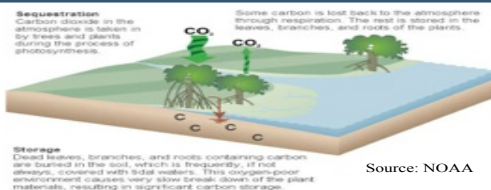
Abstract

Carbon that is sequestered in coastal ecosystems and intertidal marshes is known as "blue carbon." We investigated and analyzed sediment cores of three marshes in the Hudson Estuary to determine the amount of organic matter and carbon sequestered within them. Maps of Jamaica Bay from 250 years to the present are used to determine why there is a shift in organic matter and a decline in inorganic matter within the last estimated 300 years. We uncovered two possible impacts: i) the growth of Rockaway Spit over the last 250 years has elongated it, limiting the flow of seawater and sand into the bay, and ii) deep dredging may have altered the water flow and deposition of sediments within the bay itself.

Introduction

Wetlands play a major role in climate stability as they process and sequester large amounts of carbon. However, the quantity of carbon storage depends on the rate of production/decomposition and the environmental stresses placed upon it. The salt marshes are an integral part of the global carbon cycle. Recent studies of Jamaica Bay marshes indicate that there are a number of stressors that include waste treatment plants, deep dredging and sea level rise. Deep dredges in the bay called "borrow pits" have created artificial depositional basins. Our work focused on the amount of organic and inorganic material in sediment cores from which we are awaiting C-14 AMS dates to calculate blue carbon sequestration through time.

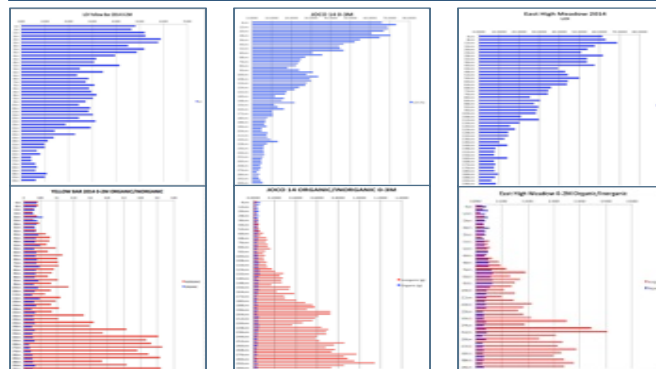
Carbon's Role in the Wetlands



Questions

How have the organic/inorganic composition of Jamaica Bay Marshes been changing through time; and what drives these changes? What is rate of blue carbon storage through time?

Results from Yellow Bar, JoCo and East High Meadow Marsh



Methodology

Step 1: Sub-sample cores at 4cm increments.

Step 2: Dry and sample for LOI.

Step 3: Analyze the data to determine organic and inorganic g/cm³ with depth.

Loss on Ignition (LOI)

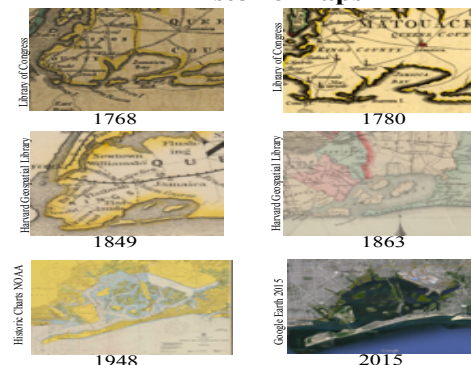
Samples were taken at 4 cm increments from the core, dried for 24 hours at 100° C, and burned at 500° C for 2 hours.

LOI = Dry Weight - Burned Weight

Dry Weight

Step 4: Pick macrofossils for AMS dates to calculate carbon g/m²/yr

Historic Maps



Conclusions

Over the past 250 to 300 years, the growth of Rockaway Spit has lessened the inundation of ocean water into the bay, probably affecting the amount of inorganic sediment carried in. This extension probably diminished the amount of inorganic sediment we find in the marsh peat. Dams on the streams entering the bay may have also limited sediment supply. The deep borrow pits created by dredging for the construction of both Floyd Bennett Field and Idlewild Airport (now John F. Kennedy International Airport) serve as artificial anthropogenic sediment sinks. Macrofossils for AMS dating, x-ray florescence, and carbon and nitrogen isotopes will aid us in calculating the rate of shifts in blue carbon and inorganic sediment through time.

Acknowledgments

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GISS
NYCRI



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NASA GISS High School STEM ARE (STEM) Academic Research Experience

AREP – Minimum Requirements:

- 16 years of age at the start of AREP, minimum 3.0 GPA, U.S. citizen.

AREP – Placement Process:

- Applicants are accepted by the research experience program at their school and recommended to participate by advisor.
- Students will be on-site for a minimum of three half-days per week while the school is in session.
- Length of placement will be a minimum of ten weeks.

Deliverables:

- Research poster and participate in a center poster session at the end of the semester/ academic year



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GLOBE



The (GLOBE) program is a worldwide hands-on, primary and secondary school-based science and education program. GLOBE's vision promotes and supports students, teachers and scientists to collaborate on inquiry-based investigations of the environment and the Earth system working in close partnership with NASA, NOAA and NSF

GLOBE community consists of more than **66,000** GLOBE-trained teachers representing over **24,000** schools around the world. In addition, over **10 million students** have participated in GLOBE -- contributing more than **100 million** measurements .

NASA / GISS and the Intrepid have partnered to provide teacher professional development in the NYC



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BEST

NASA/GISS and the Intrepid Sea Air and Space Museum have partnered to provide educators with a multi-day training to implement BEST and Intrepid STEM Curriculum into instruction for students grades K-9



The engineering design process is a series of steps that engineers use to solve problems. BEST activities are different because they provide no "recipe". Students must "imagine and plan" before they begin to build and experiment.

BEST activities include (partial list): Build & launch a Satellite to Orbit the Moon, Design a Lunar Buggy, Design & Launch a Crew Exploration Vehicle, Launch Your CEV, Build a Solar Oven, 3D Printing, Hubble Exhibit



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Excellence & Innovation through Collaborative Partnerships

NASA
The City University of New York (CUNY)
Hostos Community College
LaGuardia Community College
Queensboro Community College
Columbia University
Medgar Evers College
Opportunity Network
Goddard Institute for Space Studies
Goddard Space Flight Center
New Jersey Institute of Technology
National Science Foundation
NOAA
Intrepid Sea, Air & Space Museum
American Museum of Natural History
New York City Center of Space Science Education
Hayden Planetarium
Lamont-Doherty Earth Observatory
New Jersey City University
New York Space Grant
New Jersey Space Grant



*Bringing together the best of the New York City tri-city area and nationally
to conduct collaborative scientific research through the NYCRI*



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NEXT STEPS

- **CCRI:**
Continue to develop and expand current program and support regional partners.
- **Summer Internships:**
Contact Matthew Pearce ASAP if you would like to recruit an intern. Funding is TBD and not guaranteed. Applications period closes March 1.
- **Development of NASA GISS Education Portfolio across four lines of business:**
Purpose: Define resources, partners and program spectrum, request funding to support programs.
- **Development of NASA GISS Education Council:**
Meet with GISS science and education community on a regular basis (monthly / bi-monthly) to discuss education initiatives, programing, partner programs, resources, grants, needs, opportunities, etc.



NASA's Education Web Resources

- **NASA Wavelength: Resources for Educators**
 - <http://nasawavelength.org>
- **NASA Education: Education Express and All NASA Education Programs**
 - <http://www.nasa.gov/audience/foreducators/index.html>
- **Free Online STEM EPD:**
 - <http://www.txstate-epdc.net>
- **Search NASA Education Resources:**
 - <http://www.nasa.gov/education/materials/#.Vei6ElvrSQ0>
- **NASA For Students:**
 - <http://www.nasa.gov/audience/forstudents/index.html>
- **STEM Lessons From Space**
 - <http://www.nasa.gov/audience/foreducators/stem-on-station/lessons>
- **Internships at Goddard:**
 - <http://www.nasa.gov/centers/goddard/education/internships.html>
- **NASA Goddard Institute for Space Studies:**
 - <http://www.giss.nasa.gov>
- **NASA Goddard Office of Education:**
 - <http://www.nasa.gov/centers/goddard/education/about.html>



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Support & Partnership

Thank you for your time today!

We look forward to partnering with you,
and having you be a part
of the NASA family...



“Every great advance in science has issued
from a new audacity of imagination.”

– John Dewey



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NASA's Goddard Office of Education

Please contact me at...

Matthew Pearce

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